RUBIN NUMBER OF SOME HYDROXY COMPOUNDS

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INTRODUCTION

'GOLD NUMBER'[1] gives a measure of the protective action of a hydrophilic colloid. Hence a determination of gold number of sugars and sugar products gives a measure of the hydrophilic colloids present in them. In view of the difficulties in preparing the gold sol, rubin number can be used with advantage in the place of gold number. A measure of the rubin number of sugars has been made in the case of pure sucrose and a few white consumption sugars.[2] Although "Analar" sucrose is not a protective colloid by itself nor can have any appreciable quantity of protective colloids as impurities, it is found that it has a protective action on congo rubin. That this may be due to a possible interaction between sucrose and rubin is seen from the absorption characteristics of the mixture.[2] Hence it is of interest to study the behaviour of rubin with other substances of similar structure. This paper deals with the rubin number of some hydroxy compounds. The rubin number is determined by adopting the new technique developed by Doss and Kalyanasundaram.[3]

EXPERIMENTAL

(1) *Materials used.*—(i) Congo rubin: Congo rubin of purity 99·5% is obtained by purifying the Kahlbaum product by the method employed by Doss[4] for benzopurpurin 10 B. The purity has been determined by finding out the percentage of sulphated ash.

(ii) The buffer solution of pH 5·1 is prepared from sodium acetate and acetic acid, the pH being determined by the quinhydrone electrode.

(iii) Galactose and ethyl alcohol are pure products of Merck whereas maltose, and glycerine are of B.D.H. (Laboratory Reagent) quality. Lactose is of Kahlbaum quality. Glucose is B.P. quality supplied by the Corn Products Refining Company.

(2) *Procedure.*—5 c.c. of 0·004% aqueous solution of Congo rubin is mixed with 0·5 c.c. of the buffer of pH 5·1 and the required quantity of the substance under examination. The mixture is made up to 10 c.c. and

allowed to stand for 3 minutes. 1 c.c. of 10% sodium chloride in water is then added and the mixture heated to a temperature of 60° C. for 10 minutes and cooled to room temperature. The solution is then centrifuged to remove the blue dye in suspension. The red colour of the centrifugate is then measured by the Spekker absorptiometer using No. 604 green filter and a 0·5″ cell. The observed Spekker readings are corrected for the colour due to the substance present.

The rubin number is defined as the number of milligrams of substance necessary for obtaining a residual colour of $\frac{22{\cdot}0 + 97{\cdot}9}{2} = 60$ units of Spekker reading. The results are given in Tables I to VI and Fig. 1.

TABLE I. *Lactose*

Mg. of substance in 10 c.c. of solution	Colour of centrifugate: Spekker reading	Spekker reading for substance present	Corrected Spekker reading
0	22·0	..	22·0
100	23·3	0	23·3
200	24·2	0	24·2
300	25·4	0·1	25·3
400	25·2	0·1	25·1
800	28·2	0·2	28·0
1000	30·3	0·3	30·0
1500	37·6	0·4	37·2
2000	41·3	0·6	40·7
2500	58·8	0·7	58·1
3000	97·8	0·8	97·0
Colloid and no salt	97·9	..	97·9

TABLE II. *Maltose*

Mg. of substance in 10 c.c. of solution	Colour of centrifugate: Spekker reading	Spekker reading for substance present	Corrected Spekker reading
0	22·0	..	22·0
200	23·5	0	23·5
400	25·2	0·1	25·1
800	28·0	0·2	27·8
1000	30·8	0·3	30·5
2000	41·4	0·5	40·9
3000	55·6	0·8	54·8
4000	77·8	1·0	76·8
5000	100	1·3	98·7
Colloid and no salt	97·9	..	97·9

TABLE III. *Galactose*

Mg. of substance in 10 c.c. of solution	Colour of centrifugate: Spekker reading	Spekker reading for substance present	Corrected Spekker reading
0	22·0	..	22·0
400	23·4	0·1	23·3
800	25·3	0·2	25·1
2000	32·5	0·5	32·0
2500	35·6	0·7	34·9
3000	42·4	0·8	41·6
4000	56·2	1·0	55·2
5000	97·0	1·3	95·7
Colloid and no salt	97·9	..	97·9

TABLE IV. *Glucose*

Mg. of substance in 10 c.c. of solution	Colour of centrifugate: Spekker reading	Spekker reading for substance present	Corrected Spekker reading
0	22·0	.	22·0
1000	25·2	0·2	25·0
2000	27·7	0·5	27·2
3000	32·0	0·8	31·2
4000	35·2	1·0	34·2
5000	42·2	1·3	40·9
6000	55·2	1·6	53·6
7000	66·8	1·9	64·9
Colloid and no salt	97·9	..	97·9

TABLE V. *Glycerine*

Mg. of substance in 10 c.c. of solution	Colour of centrifugate: Spekker reading	Spekker reading for substance present	Corrected Spekker reading
0	22·0	..	22·0
609	29·2	0·1	29·1
1217	30·5	0·1	30·4
1460	39·3	0·1	39·2
1704	44·6	0·1	44·5
2191	55·2	0·1	55·1
2434	65·0	0·1	64·9
3651	99·8	0·2	99·6
Colloid and no salt	97·9	..	97·9

TABLE VI. *Ethyl Alcohol*

Mg. of substance in 10 c.c. of solution	Colour of centrifugate: Spekker reading	Spekker reading for substance present	Corrected Spekker reading
0	22·0	..	22·0
399	25·4	..	25·4
639	29·8	..	29·8
798	29·8	..	29·8
1038	45·3	..	45·3
1197	49·0	..	49·0
1437	96·2	..	96·2
1596	100	..	100
Colloid and no salt	97·9	..	97·9

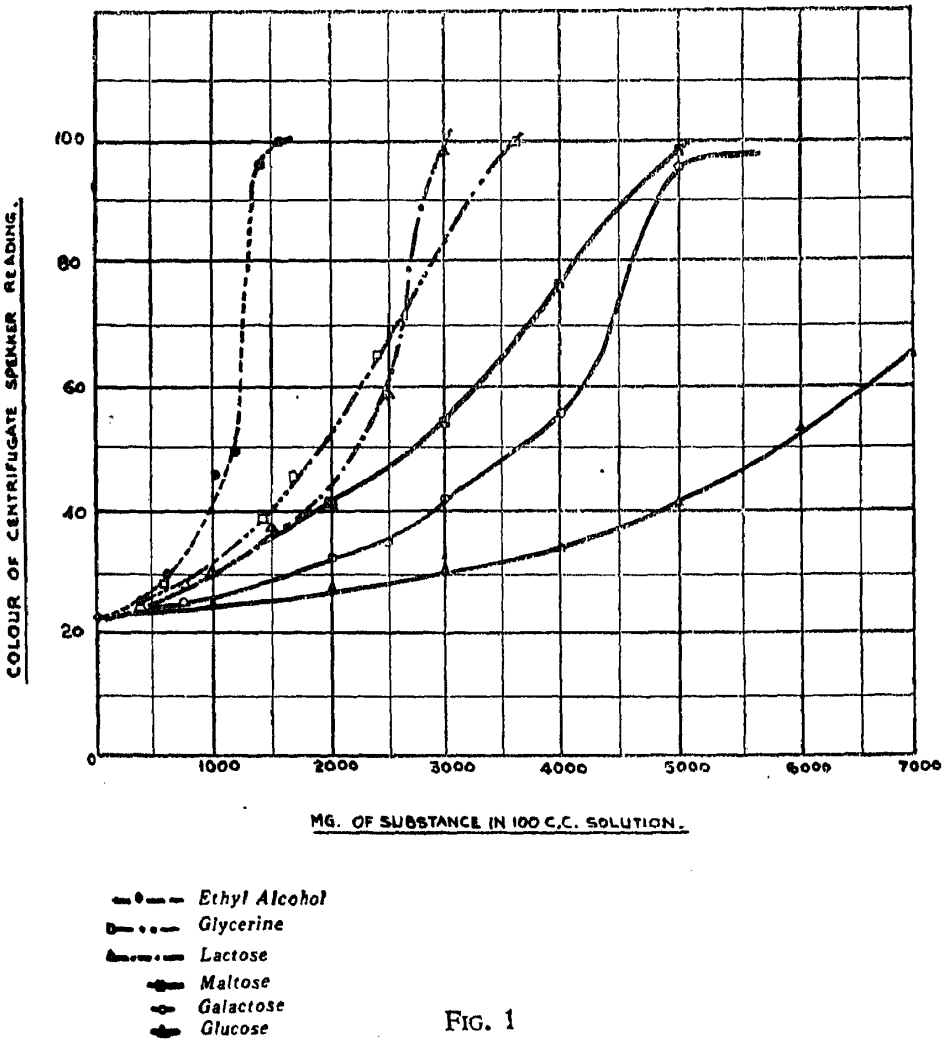

FIG. 1

TABLE VII

Substance	Rubin Number	Rubin Number expressed in Millimols.
Lactose ..	2550	7·46
Maltose ..	3280	9·59
Sucrose* ..	3100	9·07
Galactose ..	4200	23·3
Glycerine ..	2310	25·1
Ethyl Alcohol ..	1210	26·3
Glucose ..	6500	36·1

* Doss and Kalyanasundaram.[2]

DISCUSSION

It is found that the rubin numbers (Table VII) vary considerably with the different compounds examined, it being a minimum with ethyl alcohol and maximum with glucose. A fundamental comparison is somewhat difficult as the rubin number is expressed in milligrams. A more useful procedure would be to express the rubin number in millimols. The values thus obtained are given in column 3 of Table VII. An examination of these values reveals that the disaccharides have a low rubin number whereas the monosaccharides and the alcohols have a rubin number in the neighbourhood of 25. The low values obtained in the case of disaccharides is not simply due to their molecular weights being double that of hexoses. It appears when two hexoses join to form the disaccharide, the protection action of the combination is better than what should be expected on the basis of additivity. It will be of interest from this point of view to investigate the rubin number of other sugars and allied hydroxy compounds.

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SUMMARY

The rubin number of some hydroxy compounds has been determined. It is found that the disaccharides have a better protective action on congo rubin than the monosaccharides.

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